SAA NEWSLETTER

Standards Alumni Association

National Institute of Standards and Technology

Gaithersburg, MD 20899-0952

Vol. 21, No. 1 **Founding President Churchill Eisenhart (1913-1994)** **March 2005**

RABINOW HONORED FOR OCR INVENTION

Widely known NBS innovator Jacob Rabinow is to be honored this May by induction into the National Inventors Hall of Fame (NIHF).

Located in Akron, OH, the National Inventors Hall of Fame was established in 1973 by the National Council of Patent Law Associations, now the National Council of Intellectual Property Law Associations, and the Patent and Trademark Office of the U.S. Department of Commerce. This latest group of inductees includes inventors from a wide range of fields and specialties, including Les Paul (solid-body electric guitar), Dean Kaman (Segway scooter), Leo Sternbach (Valium), Clarence Birdseye (frozen food), Alec Jeffreys (genetic fingerprinting) and Matthias Baldwin (steam engine). Each of these inventors are honored based on their inventions that have changed society and improved life overall. The 2005 class will be inducted on May 14.

Rabinow was recognized for his creation of the field known as OCR, or Optical Character Recognition. He invented a process that allowed optical scanners to determine which letters or numbers were printed on a page. Financial institutions, the postal service and numerous industries embraced his technology as the basis for automation of their operations. His advanced techniques allowed machines to examine all kinds of text, regardless of font, and make a series of judgments that determined best matches with standard characters. Over the years he crafted a series of improvements that made the process more reliable, eventually incorporating dictionaries into computer memories so that the machines could determine the identity of a smudged or messy character.

Jacob Rabinow (1910-1999) was born in Kharkov, Ukraine. After living in Siberia during the Bolshevik Revolution his family moved to China and then to the U.S. He was educated in New York City and graduated from the City College of New York (CCNY) with a bachelor's degree in engineering (1933) and a master's degree in electrical engineering (1934). He was hired as a mechanical engineer by NBS in 1938. During World War II, Rabinow worked on many ordnance devices, eventually becoming Chief of the Electro-Mechanical Ordnance Division. In 1954 he left the Federal Government to form his own engineering company. Ten years later his company joined Control Data Corporation (CDC) and he was Vice-President of CDC and head of the Rabinow Advanced Development Laboratory until 1972. In 1968 Rabinow formed the RABCO company to manufacture his straight-line phonograph players. RABCO was later acquired by the Harman-Kardon Corporation. In March of 1972 Rabinow rejoined NBS to hold several positions in turn, among them Chief Research Engineer. In 1975 he retired, but returned as a consultant to evaluate inventions submitted to the Office of Energy-Related Inventions.

Rabinow held 230 U.S. patents on a very wide variety of mechanical, optical and electrical devices. Among these were mechanisms for the automatic regulation of clocks and watches, the former used in all American automobiles; the automatic letter-sorting machine used by the U.S. Post Office; the magnetic-particle clutch, widely used in automobiles, airplanes, servo-mechanisms and a great many other machines; the world's first magnetic-disc memory; the 'best-match' principle in optical and magnetic character-reading machines; many safety mechanisms for ordnance devices; and the straight-line phonograph. His patents could be classed under such diverse arts as photography, computer equipment, and card-punching and sorting equipment. For his scientific work, he held the following honors:

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*The **SAA Newsletter** is published for the members of the Standards Alumni Association in March, June, September and December. Contributions of interest to members are welcome.*

In addition to the editor Norman Belecki, Associate Editor Ralph Hudson and Compositor Leighton Greenough, members John Beers, Esther Cassidy, Bob Kamper, Jerome Kruger, Walter Leight, Rosemary MacDonald, John McKinney, Hans Oser, James Schooley, Reeves Tilley and James Wyckoff contribute on a regular basis.

The Ordnance Development Award (1945); a Certificate of Commendation from the National Defense Research Committee (1945); the Exceptional Service Award of the Department of Commerce (1949); the President's Certificate of Merit (1948); the War Department's Certificate of Appreciation (1949); the Edward Longstreth Medal from the Franklin Institute (1959); the CCNY Engineering School's 50th Anniversary Medal (1969); the Jefferson Medal Certificate from the American Patent Law Association (1973); the IEEE Harry Diamond Award (1977); the Industrial Research and Development Scientist of the Year Award (1980); Doctor of Humane Letters, Towson State University (1983); and the Lemelson-MIT Lifetime Achievement Award (1998).

He was a member of the National Academy of Engineering, the Cosmos Club, the Philosophical Society of Washington, and the Sigma XI. He was also a Fellow of the IEEE, of the American Association for the Advancement of Science, and of the Audio Engineering Society.

In addition to his technical work, Rabinow delivered hundreds of talks on technologies and inventions. He was a Regent's Lecturer at the University of California, Berkeley, a frequent guest on radio and television programs, and an author of many papers. His full-length book, "Inventing for Fun and Profit" was published in 1989 by San Francisco Press.

The complete list of 2005 inductees into the National Inventors Hall of Fame is:

Matthias Baldwin	Leopold Mannes
C. Donald Bateman	Garrett Augustus Morgan
Clarence Birdseye	Les Paul
Leopold Godowsky, Jr.	Jacob Rabinow
Robert Gundlach	Glenn T. Seaborg
Dr. Alec Jeffreys	Dr. Leo Henryk Sternbach
Dean Kamen	Selman Waksman

For further information on the NIHF, see <http://www.invent.org/>.

Sources: Forbes.com and the NIST Virtual Library

1. MESSAGE FROM PRESIDENT KRUGER

The NBS/NIST Culture

What has made NBS/NIST the indispensable institution it is? I suggest that the characteristics that define this institution can be called the NBS/NIST culture. Among them, three can be considered to be basic:

1) Essential neutral party: Because NBS/NIST is only beholden to good science and engineering and not to any other special interests, it can serve as a neutral arbiter that is

only concerned with equity in the market-place. There have been over the years many instances where it has served as the evaluator and final authority in many contentious issues involving government and industry. A recent example is its key role in the analysis of the destruction of the World Trade Center buildings, an issue fraught with legal, political and financial aspects.

(2) Basic science in the service of technology: Because good technology requires a foundation of good basic science, NBS/NIST has been one of the few institutions (the old Bell Labs was another) where top-notch science (two recent Nobel Prizes) and the best in engineering exist symbiotically.

(3) Standards that support science and technology: Science and technology depend on basic measurement standards, specifications, practices and standard reference materials. NBS/NIST has always been the repository of the standards of the United States and, in many instances, the world. These have been developed and supported by the expertise resulting from its science and engineering activities.

What is the role of SAA in this? Our alumni are the living historical memory of the NBS/NIST culture. The SAA strives to put its members' experiences and ideals to the best use of the Institute through its activities, historical and otherwise. There are many ways you can help:

- Be sure that your NBS/NIST experience is recorded in the NIST archives by filling out and submitting NIST Form 28 (this is important so that all aspects of our culture are reflected there);
- Contact Dave Lide or Ralph Hudson about writing a reminiscence of your career;
- Consider nominating someone for addition to the Portrait Gallery;
- Help recruit alumni and employees for SAA membership;
- Serve as a correspondent to this Newsletter; or
- Volunteer to help identify unknown objects for the NIST Virtual Museum.

Without your help, the SAA cannot be effective in supporting NIST and serving the alumni community! Please volunteer!

2. APRIL 6 ANNUAL DINNER MEETING

The Subject:

Issues Affecting the Federal Workforce

The Speaker:

The Honorable Chris Van Hollen,
Maryland Eighth Congressional District

Attention SAA members! At SAA's Annual Dinner meeting on Wednesday, April 6, Chris Van Hollen will describe his mission, challenges and aspirations as a member of the U.S. House of Representatives. He will highlight some of his efforts in the 108th Congress and give an overview of the 109th Congress, including issues that affect the Federal workforce, health-care topics, public education and research for a more competitive America. There will be excellent opportunities to meet with the Congressman during the reception before our dinner at 7 p.m. and following his presentation to the SAA members.

Chris Van Hollen was elected to the U.S. House of Representatives from Maryland's 8th District in November 2002. Van Hollen serves on the Committee on the Judiciary, the Committee for Education and the Workforce and the Committee on Government Reform. He is Vice Chairman of the Renewable Energy and Energy Efficiency Caucus, a Co-Chairman of the Congressional Chesapeake Bay Watershed Task Force, and a Vice-Chairman of the Democratic Task Force on Tax Policy and the Budget. Van Hollen is active in a range of subjects including education, foreign policy, environmental protection, protecting the rights of federal employees and civil rights. Prior to his election to Congress, Representative Van Hollen served in the Maryland General Assembly from 1991 to 2002, for four years in the House of Delegates and eight years in the State Senate, where he was Vice Chairman of the Budget and Taxation Committee and Chairman of the Health and Human Services Subcommittee. Van Hollen worked in the 1980s as a staff member of the U.S. Senate Foreign Relations Committee and as the Legislative Assistant for national security issues to Maryland Senator Charles Mathias. Chris Van Hollen is a graduate of the Georgetown University Law Center. His undergraduate degree is from Swarthmore College and he also holds a Master in Public Policy degree from Harvard University's John F. Kennedy School of Government.

The schedule for Wednesday April 6 is:

6:00 p.m. NIST Employees's Lounge
Social Period

7:00 p.m. NIST Lunch Club
Dinner

8:00 p.m.
Installation of SAA Officers for 2005-2006

8:10 p.m.
Issues Affecting the Federal Workforce
The Honorable Chris Van Hollen

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To attend, please complete the reservation form on page 23 and return it immediately.

Security Note: To gain entrance to the NIST site, stop at the Visitors' Center at the Main Gate where the names of SAA members are on file. You must show photo identification to obtain a nametag and access to NIST. Other guests should contact the SAA office two days prior to the meeting.

—Noel Raufaste

3. REPORT ON THE JANUARY 13, 2005 QUARTERLY MEETING

The Subject: *Building Brains for Thinking Machines*

The Speaker:
Dr. James S. Albus, Senior NIST Fellow
Intelligent Systems Division

Our speaker, Dr. Albus, has been working on Artificial Intelligence (AI) and in robotics at NBS/NIST for some 40 years. This talk presented the abstract issues involved in his work, plus a discussion of some concrete results.

The first part of the talk was philosophical, and considered the traditional mind-brain issues. The relation between the mind and the brain has been discussed in metaphysical and philosophical terms for centuries, going back at least as far as the early Greek philosophers. Now it has been brought from abstraction to concrete questions by modern technology. Albus made the distinction between BRAIN and MIND. Consider the brain first. He showed that one could describe the brain in functional terms—summarizing it as being something that generates and controls behavior, from locomotion on up to hunting, mating, etc.—in short, any activity needed for survival.

Thinking, Albus noted, is what a mind does. He itemized twenty categories, including thinking, feeling, imagining, understanding, belief, sense of good and bad, appreciation of beauty, etc., that represent aspects of mind performance. This shows that mind is a set of processes. Finally, he pointed out that these processes occur in the brain; thus "the brain is a machine that enables the processes of mentation, i.e., mind." The brain is a device 'designed' to achieve or maintain a goal. He touched on the evolutionary connection; i.e., the ultimate goal is to achieve species survival.

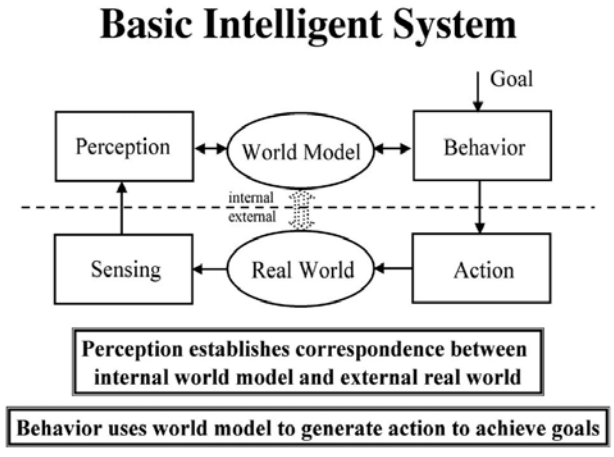
For the second part of the talk, "Can we build a 'brain' that thinks?", he went into a detailed examination of the brain's anatomical and functional organization by showing a cross-section of a human brain. Various regions therein are associated with particular functions: sensory, motor, emotional, etc. As a result of this examination, Dr. Albus concluded that the human brain consists of a hierarchical organization of (computational) modules, starting with a 'behavior generating' module (at the top). The spinal motor centers are at the bottom; the structure then proceeds through the limbic (emotional) system to the frontal cortex and forebrain, where reason, logic and abstraction exist and long-range plans are made.

Each module is itself a hierarchy of sub-modules. There is the 'sensory processing' hierarchy; then the central modules that model and evaluate the world; and, finally, the actuation modules. After describing this 'system architecture', he outlined the functional architecture. At the center of the brain are three modules that model and evaluate the world:

1. the limbic system, which generates emotional responses (22 of them!);
2. the hippocampus, which builds local maps and controls what is remembered; and
3. the thalamocortical loops which perform recursive estimations (about 5 times per second).

All of the modules are interlinked in a web of feedback loops.

His fundamental hypothesis is that each of the processes of mentation has a computational equivalent. He noted that there has been rapid progress in the neurosciences and in computer science. He returned to the above-mentioned 20 processes, claiming that they are all understood, in principle at least.



He then went into some detail on sensory apparatuses that have been devised (e.g., video cameras, radar, LADAR or laser detection and ranging), and on actuation. For the latter, we have motors, pistons, valves, electrochemical actuators, etc. However, there is nothing equivalent to muscle, and hence the strength-to-weight ratios and impedances are still a problem for bio-mimetic devices. This difficulty is not relevant for vehicular systems, however.

The third part of the talk was on a concrete application: the creation of an unmanned vehicle. First it must be able to perceive its surroundings. Then would follow the establishment of a correspondence between an internal 'world model' (in this instance, a map) and the external, real world. Finally, the behavior module uses the world model to generate action to achieve its goal: going from point A to point B.

The general process was illustrated with the 'OODA' (Observe, Orient, Decide, Act) loop. This comprises many interconnected feedback loops. Albus gave pictures of several levels of detail, showing the progression from a model of a human mind and sensory system to the kind of electro-physical systems that can simulate that model. The work he finally described culminated in modeling an explicit case: the unmanned driving of a vehicle, developed for the U.S. Army Research Lab. He also showed a functionally similar car for civilian use on roads, developed in Germany.

None of this would work without a robot having an effective means of sensing its environment. He described the use of LADAR technology for extracting detailed information about pathways, obstacles and hazards. The comparison of this information with the world model permits one to navigate successfully in the woods (having mostly static images) as well as on a road, where there are other moving vehicles.

The success of this technology was demonstrated in experiments carried out between November of 2002 and April of 2003 using robotic combat vehicles successfully in four different types of environments—three natural and one urban. Vehicle operation was 90% autonomous; that is, only 10% of the time were operator interventions needed. The complexity of the program is illustrated by noting that 176 needed tasks were identified. In terms of generality, the system coped with 1500 situations, entailing up to 10,000 attributes!

Dr. Albus concluded by saying that he thinks we are at a critical point in history—a computational theory of mind is emerging and being used to create intelligent vehicles on an experimental basis. There is a new view of what is possible. The construction of autonomous ground vehicles is imminent; he expects them to have human-level performance in 10 to 20 years. The underlying processes are understood in principle and we understand how to deal with complexity, how to acquire and use knowledge and how to make decisions. A Scientific Theory of the Mind will be achieved within decades! The consequences for humanity are as yet unknowable, but they surely will be revolutionary

—Henri Mitler

In the afternoon the group visited the labs in the Shop Building, where we examined several NIST-instrumented vehicles, including two shown in the 'videos' in the morning session. One was the truck-sized military vehicle NIST has modified over the last 10 years to operate autonomously. Another was a newer, smaller, military-type vehicle designed to operate unmanned. Both of these used laser-based LADAR for sensing position and surroundings. In addition, the lab contained a Chrysler Concorde automobile outfitted with a very precise GPS, used for studying and verifying standards. We also were shown a lawnmower-sized vehicle recently provided by Carnegie Mellon University. This uses dual stereo cameras as sensors, which will be used for continuing research purposes. Staff members Tony Barbera and Harry Scott took part in a question-and-answer session after the tour.

—Ken Gordon

The following members and guests attended the January 13 meeting:

John Albers
Jim Albus
Karma Beal
John Beers
Brian Belanger
Norman Belecki
Leighann Berg
Megan Berg
Betty Brown
C. F. Burroughs
Jack Colwell
Edgar Etz
Ken Goodwin
Ken Gordon
Leighton Greenough
Marilyn Jacox
Betty King
Ralph Krause
Walter Leight
H. S. Lew
David Lide
Rosemary MacDonald
John Mayo-Wells
Ron McKnight
Henri Mitler
Thomas Murphy
Harold Nelson
Barry Newton
Karen Novak
Don Novotny
Hans Oser
Susan Permut
Ted Prince
Noel Raufaste
Bill Ruff
Lawrence Schmid
Anneke Sengers
Gerard Stenbakken
Bob Thurber
Reeves Tilley
Richard Wright
Jim Wyckoff

4. NIST NEWS

Planning for Extreme Events by Understanding Risk

We all practice risk assessment, which guides our activities and planning to mitigate danger to health, safety or property. Robert Chapman of the NIST Office of Applied Economics in the Building and Fire Research Laboratory has contracted with the University of Pennsylvania's Wharton School to study the subject. After all, economics is called 'the dismal science' for good reasons.

In a report issued in October of 2004 Howard Kunreuther, Robert Meyer and Christopher Van den Bulte of

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the Wharton School analyzed the roles played by actual risk assessment (likelihood and consequences of prospective risks), risk perception (psychological and emotional responses) and risk management (reducing the likelihood and/or consequences of extreme events). They point out the difficulties of engaging people in addressing the hazards of unlikely events such as hurricanes, floods, tornadoes, earthquakes and terrorist threats. Today we would add tsunamis to the list. There is a complicated interplay of risk assessment, including the cost of mitigation, and perception and management of the response. The report suggests some tools to aid those in the insurance and building industries, as well as government, to get a reasonable handle on the problem.

Sources: *NIST Tech Beat*, November 24, 2004, and *Risk Analysis for Extreme Events: Economic Incentives for Reducing Future Losses*, available on-line at
<http://www.bfrl.nist.gov/oae/oae.html>

Three ATP Programs in *Scientific American's* Top 50

The Advanced Technology Program was created to support the long shots. Sometimes the long shots pay off. *Scientific American* magazine included three of the NIST co-funded efforts in its citation of 50 technologies and companies for "outstanding technology leadership" in business in 2003-2004.

The first development, a flexible computer display that can be rolled up like a sheet of paper, was developed by Motorola (Schaumburg, IL), the Dow Chemical Company (Midland, MI) and Xerox (Palo Alto, CA and Mississauga, ON) under a 2002 ATP joint venture.

The second innovation was the micro-miniature fuel cell for cell phones, laptop computers and other portable electronics. This was produced by a 2001 joint venture of MTI Microfuel Cells, Inc. of Albany, NY and DuPont, Wilmington, DE.

The third was the development of a genetically engineered yeast for producing therapeutic proteins that are compatible with the human genome system by a start-up company, GlycoFi, Inc. of Lebanon, NH, under a 2002 award.

Source: *NIST Tech Beat*, November 24, 2004

Identifying CD and DVD Media Suitable for Archiving

Long-term reliability of CDs and DVDs used for data storage is critical to government agencies, hospitals, banks and other organizations. Factors affecting long-term reliability include the maintenance of the media and specific disc-manufacturing processes.

As part of a long term project* with the Library of Congress, NIST researchers Oliver Slattery, Richang Lu, Jian Zheng and Frederick Byers of the Information Access Division, and Xiao Tang of the Advanced Network Technologies Division, tested how well recordable optical discs made with different manufacturing processes held up when exposed to high temperatures, humidity and light levels. They found that some discs performed better than others and that excessive exposure to any of these conditions can accelerate deterioration. The important finding was that some discs can be expected to store data reliably for decades.

To address the issue of how to identify high-quality media for archival applications, NIST—together with the DVD Association and several other government agencies—has formed the Government Information Working Group. This group is cooperating with the optical-disc industry to set requirements for archival-quality CD and DVD recordable media, and to specify to industry the minimum number of years that data on recordable discs must retain integrity to meet their requirements. NIST researchers are also developing a test that media manufacturers can use to determine whether the CDs and DVDs meet the criteria for archival use. Other federal agencies, as well as industry organizations, are being invited to join this effort.

*A copy of the research paper and further information on the working group are available at:
<http://www.itl.nist.gov/div895/gipwg/>.

Source: *NIST Tech Beat,* December 8, 2004

New Software Tool Sharpens Surface Images

A scanning electron microscope (SEM) produces a fine beam of electrons moved in a raster. The electrons striking a surface cause the emission of characteristic X-rays from each element. Solid-state detectors of those X-rays can sort them out by energy and so can identify the distribution of each element near the surface. Dale E. Newbury and David S. Bright have developed a software package to use that information to analyze samples without prior knowledge of their composition. The trick is to display only the dominant peak from any pixel as a separate color. Resolution of between 0.1 and 5 micrometers is obtained.

This work was reported in *The Journal of Microscopy* of November 2004, pages 186-193. The software has already been incorporated into the package of programs distributed by X-ray detector suppliers. The NIST software should be especially useful for analyzing extremely pure metals—recently shown to have superior strength, corrosion-resistance and other properties—and for monitoring nanoscale semiconductor fabrication.

Newer detectors—some developed with NIST

funding—respond so quickly that data across the entire spectrum of X-ray energies can be recorded for every pixel scanned. Typically, these data are analyzed to show only the sample's major constituents. The NIST software analyzes the data a step further by identifying the X-ray energy with the highest intensity for each pixel, rather than for the sample as a whole. Using the software with a nickel-aluminum sample, the NIST researchers identified chromium and copper contaminant particles that occupied just a single pixel and were not 'visible' with the SEM's usual data-interpretation tools.

Source: *NIST Tech Beat,* December 8, 2004

NIST/EPA Surveys Ventilation of Large Buildings

In testing ventilation in 100 government and commercial buildings, a NIST/EPA team found that actual post-construction ventilation conditions are often different than those expected based on building design. This survey is part of the *EPA Building Assessment Survey and Evaluation* (BASE) study.

Analysis of the data showed frequent under-ventilation—a condition that can cause poor air quality, occupant discomfort and even illness—as well as over-ventilation, a situation that can increase energy costs. NIST researchers Andrew Persily and Josh Gorfain of the Building Environment Division said these findings emphasize a need for early testing of the ability of a ventilation system to meet the design intent. In addition, the difference between actual and predicted ventilation rates indicates a need for subsequent regular maintenance checks. They also noted instances where ventilation-system plans could not be found and of ventilation equipment being inaccessible. Building designers were urged to remedy such situations.

An important goal of the BASE study was to define the status of the U.S. building stock in indoor air quality, ventilation and occupant perceptions of environmental conditions. The original data and their analysis should be useful in establishing standardized protocols for future indoor air-quality studies. They could also be used for examining relationships between building characteristics and symptoms reported by occupants, and for developing guidelines for building design, construction, operation and maintenance.

Sources: *NIST Tech Beat,* January 5, 2005 and
<http://www.bfrl.nist.gov/pdf/BASE-final.pdf>

Exposure to Flame Retardant in House Dust

A potentially dangerous class of chemicals called polybromated diphenyl ethers (PBDEs) are present in house dust according to an exploratory study by researchers Heather Stapleton, Nathan Dodder, Michele Schantz and Stephen Wise of the NIST Analytical Chemistry Division, and John Offenberg of EPA, published in the ACS journal, *Environmental Science & Technology Online*. Other recent studies have found that PBDE concentrations are increasing rapidly both in the environment and in human blood, fat tissue and breast milk.

Widely used for years in consumer products because they are effective flame-retardants, PBDEs have greatly increased the fire safety of products ranging from carpeting and cushions to televisions, computers and coffee makers. Although data are limited, these compounds have been implicated in developmental, reproductive, neurotoxicity and thyroid effects in rats, mice and fish, and they may be carcinogenic. Concentrations of PBDEs have been found to be higher in Americans than in Europeans, although it is not known if these levels affect human health. While some PBDE exposure may accumulate through diet, the new study found that house dust and the home environment are likely additional sources.

The NIST/EPA survey of 17 homes in the Washington, DC, and Charleston, SC, areas found concentrations of PBDEs in household dust in the range from from 700 to 30 100 nanograms per gram. Dust from floors and clothes-dryer lint were analyzed for 22 variants of commercial PBDEs. Every sample yielded positive results.

Limited though the study was, the researchers say it indicates the need for a larger study of household dust as the primary source of exposure. They also note that small children are at higher risk than adults because they are likely to spend a lot of time on floors and to put their toys and hands in their mouths.

Sources: *NIST Tech Beat,* January 5, 2005 and
< http://pubs.acs.org/journals/esthag/index.html>

Convention Center Implosion Used for Radio Experiments

When the Washington Convention Center was leveled by explosives on December 18, 2004, NIST researchers were on hand to perform experiments aimed at finding ways to improve emergency communications. The work was supported by public-safety programs of the Departments of Homeland Security and Justice.

First responders rely on radios to communicate with one another and with the outside, but radio signals are often lost in shielded or complex environments such as basements or elevator shafts. It is also difficult to detect signals through the dense rubble of buildings that have collapsed as the result of natural disasters or terrorist attacks.

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Buildings scheduled for demolition for whatever reason make excellent simulated-disaster 'laboratories'. NIST team members Christopher Holloway, Galen Koepke, Kate Remley, Dennis Camell, Susan Schima and Robert Johnk of the Electromagnetics Division placed about 25 battery-operated transmitters at various locations in the old Washington Convention Center prior to demolition. The transmitters emitted signals near the frequency bands used by emergency personnel and mobile telephones. Researchers monitored and mapped the strength of signals sent by the transmitters to receivers outside the building before, during and after the implosion.

A variety of techniques was used to detect the weak signals, including connecting receivers to improvised antennas such as metal debris in the rubble and converting radio signals to visual images. NIST researchers hope to develop reliable, cost-effective tools that can be retrofitted to existing radio systems to assist emergency personnel in locating and perhaps communicating with rescuers and other survivors trapped in a collapsed building.

Source: *NIST Tech Beat,* January 5, 2005

Tiny Magnetic Field Sensor May Find Huge Market

Using some of the same technology that allowed NIST to shrink an atomic clock to the size of a grain of rice, seven NIST scientists—Peter Schwindt, Svenja Knappe, Vishal Shah, Leo Hollberg, John Kitching, Li-Ann Liew and John Moreland—have managed to create a tiny magnetic field sensor. The magnetometer, when packaged with associated electronics, can be about the size of a sugar cube but, despite its smallness, it has a sensitivity of about 50 picoteslas. Packaged as a hand-held, battery-operated device, the magnetometer could detect a rifle 12 meters away or a buried steel pipe up to 35 meters underground. It could be used in a variety of other ways, such as for geophysical or medical investigations.

The operation of the device depends on tiny changes in the absorption of light from a precisely tuned laser beam in a rubidium-vapor cell. It was produced with fabrication techniques used on semiconductors and micro-electromechanical systems, and so should be capable of being mass-produced at low cost. It is likely to replace other, much larger, magnetometers for many uses, and open the way to completely new applications.

Sources: *NIST Tech Beat*, January 5, 2005 and *Physics Today*, v. 58, no. 2, February 2005, p. 9

One Last Use for Old Buildings

Building and Fire Research Laboratory engineers, Daniel Madrzykowski, David Stroup and William Walton turned a demolition plan into an opportunity to assess a fire hazard. Recent college-dormitory-fire catastrophes have drawn attention to the hazards associated with a rapid spread of fires. Two barracks were donated by the Myrtle Beach, SC, Air Force Base Redevelopment Authority. The NIST researchers instrumented the two buildings to measure the temperature at various locations in dormitory rooms and hallways. One building was equipped with a sprinkler system; the other was not. With fires started in one room, it was convincingly demonstrated that safe escape from the building with sprinklers was likely, while the second barracks fire would have been deadly to occupants.

A video recording of the tests, prepared by the US Fire Administration, is being used to educate college administrators and students.

Source: *NIST Tech Beat*, February 10, 2005

—John Beers and Jim Wyckoff

President Submits NIST FY 2006 Budget Request to Congress

The President has requested $532 million for NIST for FY 2006. The request is divided into three appropriations as follows:

- $426.3 million for Scientific and Technical Research and Services (STRS), a 12.5% increase over the 2005 appropriation. Of this, $420.6 is for the NIST Laboratories, technical programs and major user facilities, and $5.7 million is for the Baldridge National Quality Program.

- $46.8 million for Industrial Technology Services (ITS) for funding the Manufacturing Extension Partnership Program (MEP). The request proposes termination of the Advanced Technology Program (ATP).

- $58.9 million for Construction of Research Facilities (CRF) to cover critical safety, maintenance, repairs and facilities' upgrades.

The STRS request includes **three research initiatives**: (1) an increase of $19.6 million to fund a multifaceted program on **Advances in Manufacturing**, with components addressing nanomanufacturing (+$4 million), efficient manufacturing-enterprise integration (+$1.6 million), and expansion of U.S. access to global markets through improved measurements and standards (+$4 million). Establishment of a national nanomanufacturing and nanometrology facility at NIST (+$10 million) is a key part of this initiative; (2) an increase of $3 million for an expanded program in **Measurements and Standards for Homeland Security** focused on improved safety standards and guidelines for

building codes, and equipment for emergency first responders (+$2 million), and improved biometrics for personal identification (+$1 million); and (3) an increase of $17.2 million for **New Measurement Horizons for the U.S. Economy and Science** to improve the nation's fundamental measurement capabilities in three key areas—biosystems and health (+$7.2 million), interoperability and security for complex scientific systems (+$2 million), quantum computing (+$4 million)—and an expansion of the NIST Competence Program to foster new measurement capabilities needed in developing areas of science and technology (+$4 million).

The CRF request includes an increase of $32 million to address pressing facility-modernization needs, primarily at the NIST Boulder labs. This amount will also increase the NIST annual safety, capacity, maintenance and major repairs budget for both Gaithersburg and Boulder, thereby reducing continual costly deterioration and obsolescence problems at both sites. It also includes an increase of $3.4 million to support necessary preventive maintenance for NIST's Advanced Measurements Laboratory—one of the world's most sophisticated laboratories and a valuable national resource for critical measurements in nanotechnology, biotechnology, quantum computing and other exacting fields.

Source: NIST Office of Congressional and Legislative Affairs

New Congressional Committee Assignments

The Congress has made several new assignments on Committees having appropriations and/or oversight responsibilities important to NIST. These include:

House Committee on Appropriations
Jerry Lewis (R-CA), Chairman
David Obey (D-WI), Ranking Minority Member

Subcommittee on Science, State, Justice and Commerce
(Note new name)
Frank Wolf (R-VA), Chairman
Alan Mollohan (D-WV),
Ranking Minority Member

House Committee on Science
Sherwood Boehlert (R-NY), Chairman
Bart Gordon (D-TN), Ranking Minority Member

Subcommittee on Environment, Technology and Standards
Vernon Ehlers (R-MI), Chairman
David Wu (D-OR), Ranking Minority Member

Senate Committee on Appropriations
Thad Cochran (R-MS), Chairman
Robert Byrd (D-WV), Ranking Minority Member

Subcommittees have not yet been determined.

Senate Committee on Commerce, Science and Transportation
Ted Stevens (R-AK), Chairman
Daniel Inouye (D-HI), Ranking Minority Member

New Subcommittees that have no appointments yet:

Subcommittee on Science and Space

Subcommittee on Technology, Innovation, and Competitiveness

Subcommittee on Disaster Prevention and Prediction (will have oversight over the National Earthquake Hazards Reduction Program)

Source: NIST Office of Congressional and Legislative Affairs

—Esther Cassidy

5. NIST HONORS AND AWARDS

At *The 32nd Annual NIST Awards Ceremony* in December, sixty-three employees received *Bronze Medal Awards for Superior Federal Service*. They are: *OFFICE OF THE DIRECTOR*—**Kevin A. Kimball** (individual); **Robert J. Densock**, **William A. Haag, Jr.**, **Mary E. Monaghan** and **Deana J. Ramsburg** (group); and **Carol A. Wood** (i); *TECHNOLOGY SERVICES*—**Elisabeth M. Gomez** (i); **A. Jane Blessley**, **Gail K. Ehrlich**, **Claire M. Saundry** and **Cathy A. Smith** from the Director's Office, and **Mary P. Clague**, **Bruce E. Mattson** and **Jack E. Pevenstein** from Technology Services (g); *MANUFACTURING EXTENSION PARTNERSHIP OFFICE*—**A. Romain Tweedy** (i) and **Lillian L. Ware** (i); *ELECTRONICS AND ELECTRICAL ENGINEERING LABORATORY*—**James A. Beall**, **Margaret S. Crews** and **Jonathon A. Koch** (g), and **Pavel J. D. Kabos**, **Anthony B. Kos** and **Thomas J. Silva** (g); *MANUFACTURING ENGINEERING LABORATORY*—**David C. Stieren** (i); **Roger V. Bostelman**, **Tommy Y. Chang**, **Tsai Hong**, **Adam S. Jacoff**, **Richard J. Norcross**, **Harry A. Scott**, **Michael O. Shneier** and **Brian A. Weiss** from the Manufacturing Engineering Laboratory and **Geraldine S. Cheok** and **Alan M. Lytle** from Building and Fire Research (g); *CHEMICAL SCIENCE AND TECHNOLOGY LABORATORY*—**Robert D. Chirico**, **Qian N. Dong** and **Michael Frenkel** (g), **George C. Rhoderick** (i), **Dean C. Ripple** and **Gregory F. Strouse** (g), **Mark A. Sobolewski** (i) and **Cynthia L. Zeissler** (i); *PHYSICS LABORATORY*—**Edward A. Early** and **Maria E. Nadal** (g), **Michael G. Mitch** (i), **Joseph P. Rice** (i) and **Robert E. Vest** (i); *MATERIALS SCIENCE AND ENGINEERING*

(Continued on next page)

LABORATORY—**Alec J. Belsky** (Technology Services) and **Vicky L. Karen** (g) and **Taner Yildirim** (i); *BUILDING AND FIRE RESEARCH LABORATORY*—**Jason D. Averill**, **Nelson P. Bryner**, **Richard W. Bukowski**, **Thomas J. Cleary**, **Richard D. Peacock** and **William D. Walton** (g), and **George W. Mulholland** (i); *INFORMATION TECHNOLOGY LABORATORY*—**Mary C. Brady**, **Sandra I. Martinez**, **Carmelo Montanez-Rivera**, **Richard M. Rivello** and **John M. Tebbutt** (g); **Mark E. Carson** and **Stefan D. Leigh** (i).†

The *Eugene Casson Crittenden Award* recognizes superior achievement by employees who perform supporting services that have significant impact on technical programs beyond their own offices. Recognized this year were **Bernard Brusko** (planner-estimator), **Andrew G. Halich** (planner-estimator) **Ernest E. Matthews, Jr.** (custodian), **Mark R. Miller** (supervisory firefighter), **Kenneth E. Seward** (sheet-metal mechanic), **Dean J. Smith** (electronic technician), **Nancy J. Snyder** (engineering draftsman) and **Leon A. Urbain** (utility-systems repair operator).

The *Allen V. Astin Measurement Science Award* was presented to the team of **Timothy J. Burns** (mathematician), **Brian S. Dutterer** (instrument maker), **Richard J. Fields** (metallurgist), **Michael D. Kennedy** (engineering technician), **Lyle E. Levine** (physicist), **Richard L. Rhorer** (engineer), **Eric P. Whitenton** (engineering technician) and **Howard W. Yoon** (physicist) for the measurement of stress-strain relationships of materials under high heating-rate, high strain-rate conditions—resulting in validation of theoretical relations between microstructure transformation due to elevated temperatures and the resulting stress-strain behavior of the bulk material.

Ronald G. Munro was presented the *Edward Uhler Condon Award* for distinguished achievement in written exposition in science and technology. Dr. Munro was cited for eloquent and systematic exposition of data evaluation as a scientific discipline in his recommended practice, *Data Evaluation Theory and Practice for Materials Properties*, NIST Special Publication 960-11, June 2003.

The *Judson C. French Award* is for significant improvements in NIST products delivered directly to industry (e.g., calibrations services, SRMs). There were three awards this year. The first was given to **Dr. Paul A. Williams**, a physicist, for providing the world's first reference materials and most sensitive techniques for measuring polarization-mode dispersion (PMD) in optical fibers and components. PMD effects broaden pulses and thus limit the bit-rates of communications systems. **Eric S. Stanfield**, a physical science technician, was recognized for making significant improvements in NIST dimensional standards services, including reducing staff effort in providing the services and improving quality through the development of a quality system compliant to ISO 17025. The final award was presented to the team of **Peter J. Linstrom** (chemical engineer) and **W. Gary Mallard** (research chemist) for their development of the NIST Chemistry WebBook, which revolutionized the delivery of physical- and chemical-property data to NIST customers. Some 600 000 users access the WebBook annually to look up the most recent data on materials' properties.

The *Jacob Rabinow Applied Research Award* went to **Paul C. Brand** (materials research engineer), **Richard J. Fields** (metallurgist) and **Henry J. Prask** (physicist) for developing the nation's best capability for measuring residual-stress depth profiles and texture of metals, ceramics and composites. Their work—done in collaboration with industrial organizations, the Army and Navy, DoT, DoE and ten major universities—has had major impact on most metal-manufacturing processes, especially those in the transportation field.

The *Edward Bennett Rosa Award* for the development of outstanding engineering, scientific or documentary standards was given to **Douglas H. Blackburn** (guest researcher), **Steven J. Choquette** (chemist), **Edgar S. Etz** (chemist) and **Wilbur S. Hurst** (physicist) for their development of SRMs 2241–2244, Raman intensity-correction standards that will allow—for the first time—accurate comparisons of data from widely differing Raman spectrometers used in process measurements and for quality control.

Jonathan W. Martin, a physical scientist, was presented the *William P. Slichter Award* for building ties between NIST and industry. Martin was recognized for continued efforts in establishing numerous industrial consortia addressing needs of the coatings and sealants industry, and raising over $ 1.5 million in support of research, the results of which are transferred to industry via oversight boards and international symposia.

The *Samuel Wesley Stratton Award* for outstanding scientific or engineering achievement went to NIST Fellow **Paul S. Julienne**, the pre-eminent theorist in the fields of ultra-cold collisions and photo-association physics, for defining the course of theory by integrating the fundamental concepts of molecular spectroscopy and atomic-collision dynamics for application to the field of laser cooling of atoms, achievement of Bose-Einstein Condensation and time-and-frequency metrology.

Thomas C. Chung and **John J. Garguilo** received the *George A. Uriano Award* for improving the business processes of the Advanced Technology Program by implementing an Internet-based Electronic Proposal Review System and an Electronic Submission System, the latter used for submitting new proposals to the ATP. The Award was established to recognize staff efforts to strengthen NIST

† Space limitations preclude listing the achievements of Bronze Medal recipients!

extramural programs fostering U.S. competitiveness and business excellence.

The *Safety Award for Superior Accomplishment* went to **Michael D. Kennedy** (engineering technician) for his active role in ensuring the safe operation of the Pulse-Heated Kolsky-Bar facility used to measure the mechanical properties of samples rapidly heated to very high temperatures.

There was no *Equal Employment Opportunity/Diversity Award* given this year.

External Recognition

Eric J. Amis, Chief of the Polymers Division, was elected Fellow of the American Chemical Society (ACS). His citation reads: "For outstanding contributions to the fundamentals of polyelectrolytes and leadership in applying combinatorial techniques to the broad range of polymer related topics." He was formally honored at the ACS San Diego Meeting on March 14.

On February 22 **Belinda L. Collins**, Acting Director of Technology Services, received the *Margaret Dana Award* for outstanding contribution in the development of voluntary consumer-product standards from ASTM International. Her citation reads, "In recognition of outstanding leadership in facilitating the effective participation by the Federal Government in domestic and international standards activities and managing essential support services to consumer product and other standards' development."

The Institute of Electrical and Electronics Engineers (IEEE) has elected **Pavel J. D. Kabos** to Fellow Grade for contributions to the metrology of high-frequency, spin-wave dynamics in bulk and thin-film magnetic structures. Kabos is the leader of the RF Nanoscale and Molecular Probing Metrology project in the Electromagnetics Division (Boulder Labs.).

The American Physical Society (APS) has honored **Alamgir Karim** by his election as Fellow. He was cited for pioneering research on polymer thin films and interfaces, polymer brushes, blend-film phase separation, thin-film de-wetting, pattern formation in block copolymer films, and the application of combinatorial measurement methods to complex polymer-physics problems. He is currently detailed to the NIST Program Office from the Polymers Division. Karim was nominated by the Division of Polymer Physics.

Robert Edward Schwall has been elected Fellow of the APS. He was nominated by the Forum on Industrial and Applied Physics "for contributions to superconducting materials and applied superconductivity." Schwall heads the Quantum Information and Terahertz Technology project in the Quantum Electrical Metrology Division.

The APS also selected **Mark David Stiles** of the Electron and Optical Physics Division as a 2005 Fellow for his creative and skillful use of first-principles calculations and phenomenological models that have substantially contributed to our understanding of the physics of magnetic heterostructures. He was nominated by the Division of Materials Physics.

Perry Falknor Wilson, leader of the Radio-Frequency Fields Group in the Electromagnetics Division, was elected to Fellow Grade of the IEEE for his contributions to the theory of electromagnetic-compatibility test methods and the development of international standards.

—Norm Belecki

6. BOULDER BABBLE

The Local Scene

Our local campus of the University of Colorado has achieved national notoriety again, this time through the activities of Professor Ward Churchill, late Chairman of the Department of Ethnic Studies. Professor Churchill holds very strong views on the aggressive nature of U.S. policy and actions towards other nations in general, and the Native American nations in particular, and has tested the limits of free speech and academic freedom by his extremely aggressive manner of expressing those views in public.

Nobody took much notice of him until he was recently invited to speak at Hamilton College in New York, and the invitation was opposed (and later withdrawn) because of an essay he had written three years previously, in which he argued, in somewhat incendiary terms, that the terrorist attacks on the World Trade Center and the Pentagon were legitimate military reprisal for injuries caused by American foreign and commercial policy. Many people then read the essay (or reports of it) and got very angry. There were threats of death, calls for his firing and even for abolition of his department, and demonstrations of protest (both for and against), which started a passionate debate about free speech and academic tenure. The Governor of Colorado, who demanded to have him fired, tried to finesse the issue by saying that, although he has his citizen's right to free speech, Professor Churchill has no right to publish such offensive statements while he is employed by the taxpayers of Colorado. That brought the immediate response from several faculty members that the Governor's argument is diminished by over an order of magnitude by the fact that only 7% of the funding of the Boulder campus is derived from the State treasury. The Regents of the University, who inherit a patchy record of defense of tenured faculty members, held a meeting (with stormy audience participation) in which they did not

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immediately accede to the Governor's demand but instead appointed a committee to examine Professor Churchill's published work to determine if there is cause to fire him for incompetence. Judging by various reports in the press, there is a fair chance that they will find some.

On a lighter note, the prairie dogs are raising their cute little heads into the news again, this time by their fertility, which is leading to rather obvious overpopulation (and this is a species that some people would like to see on the Endangered Species list). Boulder has a City Ordinance stating that a legitimate attempt to relocate prairie dogs occupying a building site must be made before permission will be granted to exterminate them, but all the appropriate sites for relocation in Boulder County are now saturated, and a State law prohibits transporting them across a county line without the approval of the receiving county's Commissioners (which is unlikely to be given). A public park in North Boulder is to be protected from the encroaching prairie dogs by an elaborate fence (against some vigorous public opposition), and surely other defenses will follow.

Meanwhile, a proposal for the route of the NIST fence is up for consideration in Washington. It is the result of lengthy negotiations with the City and other interested parties, and the final form encloses the 'research area' only, with no encroachment into the open space easement that was granted to the City some time ago. In principle it should be acceptable to everybody, although you wouldn't know it by listening to some of the comments that are still being made. The most prominent construction on the site is a fancy new gatehouse at what is to be the new entrance when it is completed in the summer. This will be a short distance south of the present entrance (which will be closed) and will have full access to Broadway with a new set of traffic lights.

Hidden among the other buildings, the new utilities building is nearing completion. The first phase of its operation will be to provide compressed air and steam to the two nearest laboratory buildings. Chilled water will be added later, together with an extension of service to all the other buildings of NIST. We have needed this facility ever since the Boulder labs were constructed in the early 1950s.

The Grand ThermoData Engine

Michael Frenkel has spent the major part of his career (over 25 years) in the business of generating and refining the data on the thermophysical properties of materials that are at the design heart of chemical-engineering processes. This has become a huge field that generates data at a rate that doubles every decade and stands at about 300,000 points per year now. New processes demand data on new materials and new research produces refinements of existing data, so the traditional process of publication in journals and collection in databases for access by engineers is becoming too cumbersome to cope adequately. Michael and his colleagues set out to create a computerized system that will produce the required data on demand, and ended up with a moderate reorganization of the publishers on one side and the process engineers on the other.

The core of the ThermoData Engine (TDE), as Michael calls it, is a big computer program that generates the best available value (with an estimated uncertainty) of any quantity that is demanded, derived from a comprehensive internal data base that is constantly revised as new information becomes available, and an application of artificial intelligence to interpolate or extrapolate as needed, choosing and using the best available formula for the purpose. It is clearly a very labor-intensive business to feed this engine's voracious appetite for data, so Michael employs a group of about ten University of Colorado science students under the Professional Research Experience Program (PREP), that offers part-time employment at NIST. The five major international thermophysical-properties journals supply directly all the new data they receive in a standard format, which they are persuading their contributors to use, and the PREP students evaluate and enter these data under the guidance of another artificial intelligence program called Guided Data Capture. The other end of the process presented the task of persuading commercial, computer-aided-design programmers to abandon their individual databases and connect to the TDE instead. Michael is still working on this and is optimistic for success.

A New Magnetic Sensor

Some time ago I mentioned the minuscule atomic clock that John Kitching and his coworkers have created. Their next act was to adapt it to become a very sensitive and compact magnetic sensor by the simple means of substituting rubidium 87 for the cesium vapor that is the standard for atomic clocks, thereby generating a frequency that is sensitive to magnetic field.

The 'gold standard' (or 'cold standard') for sensitivity of magnetometers was set some time ago by Jim Zimmerman's work with superconducting quantum-interference devices (SQUIDS), and is of the order of a femtotesla per root hertz. This is well below the level of ambient magnetic noise in most places (of the order of a nanotesla per root hertz at 1 Hz in a typical laboratory), and is usable only in specially controlled conditions. This sensitivity is rivaled by existing optical magnetometers that are also based on alkali metal vapors, but both of these instruments are quite bulky and consume a fair amount of power. By contrast, the new device has a sensitivity of 50 picoteslas per root hertz, which in principle could be improved to approach a fundamental limit that is three orders of magnitude better, but it wins handsomely on portability.

It and all its ancillary electronics can be packed into a space of one cubic centimeter and it can be battery-operated. Its present power consumption is 195 mW, which also can be reduced, perhaps fourfold, by foreseeable improvements.

Error Correction in a Quantum Computer

All modern computers depend upon rather small devices, operating with minimal exchange of energy, in a boisterously noisy electromagnetic environment. Errors happen frequently, and must be detected and corrected by some efficient process that does not introduce unacceptable delay of the logical process. This will be particularly true of quantum computers, just now in the early stages of demonstration of feasibility, because they will depend on the encoding and manipulation of information in the quantum states of single atoms (or small assemblies thereof)—the most fragile mechanism imaginable—and their main function will be to perform computations of enormous complexity. Dave Wineland's group is a world leader in the development of quantum computing, and Dietrich Leibfried has led the group's effort to demonstrate a workable system for error correction.

One unique feature of information stored in the quantum state of an atom is that it cannot be read or copied without destroying it, which promises perfect privacy in quantum communication but poses a challenge when backup copies are needed. The solution that Dietrich proposed and the group demonstrated avoids this problem by using three entangled atoms instead of just one as the basic storage unit.

The little computer used in this work consists of a string of beryllium ions held in a linear electromagnetic trap. They can be separated and brought together by small manipulations of the trap, and their quantum states can be switched in a predictable way by laser pulses of carefully tailored wavelength, intensity and duration. To apply the error-correction method, two ancillary beryllium ions that have been prepared in a known quantum state are brought into close proximity with the beryllium ion that carries the bit of information to be preserved. The three ions interact with one another to enter a shared quantum state, in which condition they are stored until the information is needed. They are then separated into an 'entangled' state that preserves a memory of the combined state, so that by interrogating the two ancillary ions enough information can be gleaned to detect and correct any error that may have occurred during storage. And it works!

And a Bit of Bragging

At the end of every year many magazines publish lists of what their editors regard as the top stories of the year, and the science magazines are no exception to this practice. Looking back at the year 2004, *Discover Magazine*, *Popular Science*, *Science News*, *PhysicsWeb*, and the AIP came out with three stories from NIST, all three from the Boulder Labs. They are: Debbie Jin's group's demonstration of the pairing of potassium-40 atoms at a temperature in the nanokelvin range into a state that is analogous to, but not quite the same as, the Cooper pairs of superconductivity, Dave Wineland's group's demonstration of quantum teleportation of information, and Leo Hollberg's group's ultra-miniature atomic clock.

—Bob Kamper

7. NECROLOGY

Charles P. "Chuck" Howard*, 81, a former NBS mechanical engineer, died on November 28, 2004 in Corte Madera, CA after a long illness. He suffered from aphasia.

Born in Dallas, TX, he served with the U.S. Marine Corps during World War II in the Pacific theatre.

He graduated from Texas A & M University with a B.S. in 1949 and an M.S. in 1951, both in mechanical engineering. He held a *Humble Oil Fellowship* at Texas A&M from 1949 to 1950. Howard also attended Stanford University from 1952 to 1954, obtaining a degree in engineering in 1960. He held a *Standard Oil of California Fellowship* during his first year at Stanford.

Chuck began his career in 1954 as an Associate Professor of Mechanical Engineering at the Naval Postgraduate School in Monterey, CA. He left there and came to the Washington area in 1964, first as a project engineer, Marine Gas Turbines, Bureau of Ships, U.S. Navy, and then, in 1966, as Professor of Mechanical Engineering at Catholic University. From 1970 to 1974 he was Chairman of the Engineering Technology Department, Prince George's Community College in Largo, MD.

In 1974 Howard came to the Product Systems Analysis Division of the Center for Consumer Product Technology that summer and worked in the Appliance Labeling Section for two years. He then became Group Leader of the Energy Utilization Group in the Product Engineering Division. The purpose of this group was to provide engineering and laboratory evaluations of the energy consumption, efficiency and other performance characteristics of consumer products. This involved analysis of product design, testing and measurement of performance in the laboratory or through computer simulation, studying the effect of changes in operating conditions or in product design, and reporting these results. He was responsible for most of the test methods used in the appliance-labeling program, which gave us the yellow labels that we see on household appliances today. He received a Department of Commerce Silver Medal in 1978 for "outstanding technical contributions to the development

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of test methods for the measurement of energy consumption and to the establishment of energy efficiency improvement targets for ten categories of appliances identified as NBS responsibilities under the Energy Conservation and Production Act of 1976." His dedicated efforts, overall technical competence and excellent managerial skills resulted in a set of test methods and energy improvement targets which under law the manufacturing industry must use to measure energy-efficiency improvements and to develop annual energy-consumption figures. As a result, Mr. Howard's work is reducing the energy consumed by ten categories of household appliances. He retired in 1981.

After leaving NBS and moving to California, he became Director of Regional Services in the Western Division of the American Society of Mechanical Engineers in San Francisco.

He was a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers, the American Society of Mechanical Engineers, the American Nuclear Society, the American Society for Engineering Education and the American Society of Naval Engineers. He was also a member of Tau Beta Pi, the Texas A & M Scholarship Honor Society, and Sigma Xi.

He golfed at Manor Country Club, in Rockville, MD, and was a member of the NBS Golf League.

He is survived by his wife, Clara, of Corte Madera.

Sources: NIST Archives, Ken Yee and Andy Fowell.

Paul H. Lebowitz, 71, a former NBS computer specialist in the Electronics Division, died on January 1, 2005 at his home in Rockville, MD. He had congestive heart failure.

Mr. Lebowitz was born in Washington, DC and raised in Mount Rainier, MD. He was a graduate of McKinley Technical High School in Washington and attended the University of Maryland and the University of Virginia. He was an Army veteran of the Korean War.

In 1951 he joined the Electronic Computing Section of the Electronics Division and was part of the team building the Standards Eastern Automated Computer (SEAC). He left NBS at the end of 1952. He also worked on computer and satellite technology at the National Aeronautics and Space Administration and spent 24 years with General Electric Information Services Co. before retiring in 1995 as a senior systems analyst.

His avocations included gourmet cooking and woodworking.

He was a former board member of the Browne Academy, a private school in Alexandria, and did volunteer work for *Recording for the Blind and Dyslexic*.

His marriage to Harriet Alexander Lebowitz ended in divorce.

Survivors include his wife of 32 years, Sandra Sallee Lebowitz of Rockville; two children from his first marriage: Larry of Miami, FL and Marci Lebowitz-Kurtz of Naperville, IL; three stepchildren he raised as his own: Lauren Beck of Roanoke, Peter Sallee of Washington and Emily Gallagher of Monrovia, MD; and three grandchildren.

Sources: NIST Archives and *The Washington Post*, January 5, 2005

Sharon Garrison Lias, 69, a NBS research chemist for over 40 years, died on November 29, 2004 after a long illness. She was a resident of Washington, DC.

The eldest of the three daughters of General W.C. and Mrs. Jessie Garrison, she was born in Oklahoma and raised on army bases across the country. She received her B.S. in chemistry from the College of William and Mary in 1957, and her M.S. and her Ph.D., both in physical chemistry, from American University in 1965 and 1971, respectively.

Sharon first came to NBS as a summer student in 1954 and 1955 to work in the Chemistry Division. After receiving her bachelor's degree, she worked in the Molecular Structure and Properties Section and several sections concerned with radiation chemistry in the Physical Chemistry Division.

From 1971 to 1973, Sharon trained at Rockefeller University and authored three papers with Professor Frank H. Field, who invented Chemical Ionization Mass Spectrometry. She applied this new method to gas-phase ion-molecule reactions at high pressures, complementing her work on ion chemistry using radiolysis and low-pressure, ion-cyclotron mass spectrometry. This ion-chemistry work supported her NBS/NIST contributions to ion-chemistry data. She worked in the Environmental Chemical Processes Section from 1975 to 1978. The next year she became Director of the Ion Energetics Data Center, a position she held until she returned to research as Group Leader in Ionizing Radiation and Aqueous Kinetics in 1983. Later she was detailed to the Standard Reference Data Program where she was manager for Physical Data (1986-1987) and led a huge data evaluation and compilation effort that culminated in the publication of Supplement #1 to Vol. 17 of the *Journal of Physical and Chemical Reference Data* (1988) entitled "Gas-Phase Ion and Neutral Thermochemistry" that has become the definitive source of the thermochemical properties of ions. Frequently referred to as the 'GIANT Tables', it has received more than 4000 citations. That year she became Chief of the Chemical Kinetics and Thermodynamics Division. She retired in 1995 and was named Scientist Emerita, a position she held until 2001. Dr. Lias is especially remembered by colleagues at NIST as their mentor.

She was awarded the Department of Commerce Silver Medal in 1978 for "her exceptional skill in exploring and explaining the chemical and thermodynamic properties of electrically charged molecules." Her pioneering studies of the reactions of ions in liquids and gases made possible the development of the analytical method known as 'chemical ionization mass spectroscopy'. Dr. Lias played a major role in establishing the Bureau as a leading center of research in ion kinetics and thermochemistry.

She also received the Department of Commerce Gold Medal (1985) for "her exceptional leadership in the development of standards and data in ion energetics and for her outstanding contributions to the field of ion chemistry." As Director of the Ion Energetics Data Center, Dr. Lias established NBS as the focal point for all data activities involving electrically charged species. These data are essential to the synthesis and characterization of chemicals; to the modeling of flames, plasmas, and planetary atmospheres; and in laser design and pollutant identification. Dr. Lias was recognized nationally and internationally for her personal contributions to key measurements of the thermodynamic properties of ions. She wrote over 100 papers in her field. She served as a member of the *NBS Journal of Research* Board of Editors, representing Chemistry, from 1983 to 1989.

She was a member of the American Society of Mass Spectrometry (ASMS) and the ASMS Board of Directors, 1995-1997; the Chair of the ASMS Committee on Standards and Measurements, 1995-1996; and a member of the ASMS Fundamentals Interest Group. She was also on the Editorial Board of the series, *Molecular Structure and Energetics*, VCH Publishers, Inc., co-editor of *Structure/Reactivity and Thermochemistry of Ions*, D. Reidel Publishing Co. and a member of the Executive Council of the Joint Committee on Atomic and Molecular Physical Data, the American Institute of Physics Subcommittee on Numerical Data Bases, and the Advisory Committee for the Clearinghouse for Digital Infrared Spectra.

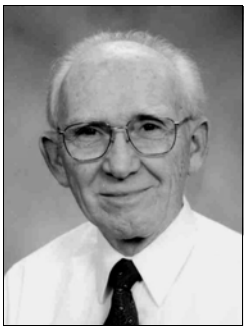
Survivors include her mother, her husband, her daughter and her grandson.

Sources: NIST Archives; *The Washington Post*, December 3, 2004; and Phoebe Fagan, Marilyn Jacox and Michael Maunter

Robert E. McCoskey, 79, a former physicist in the Heat and Power Division, died of an acute infection on January 16, 2005 at Montgomery General Hospital. He lived in Rockville, MD.

Mr. McCoskey was born on January 11, 1926 in Kirksville, MO and spent his youth in a succession of Midwestern states. In 1942 the family established residence in Washington, DC, where he attended Eastern High School, graduating in 1944. He began part-time studies at George Washington University and received his bachelor's degree in physics in 1950. He attended additional courses in mathematics and physics at the graduate level, earning a master's degree in physics in 1955.

Having worked in the Heat and Power Division at NBS from 1944 while going through college, McCoskey joined its staff as a physicist in 1948 and began to study data from the military's Nevada Test Site. He transferred to the Diamond Ordnance Fuze Laboratory in 1954 to work on the analysis of the electromagnetic pulse-effects of nuclear explosions. After DOFL became the Harry Diamond Laboratories in 1962, he moved with HDL to the U.S. Army's Research Laboratory in Adelphi, MD. Bob became Chief of the electromagnetic-pulse laboratory there. When he retired in 1981 he was Chief of the Army Electronics Research and Development Command. After this he was a senior scientist at Kaman Sciences in Alexandria for two years, and then a senior associate at Booz Allen Hamilton in Bethesda, MD until his final retirement in 1990.



Mr. McCoskey was a deacon at Warner Memorial Presbyterian Church in Kensington, MD. He was a member of Manor Country Club in Rockville, the Maryland Senior Golf Association and The Fossils (of Chevy Chase, MD).

Survivors include his wife of 54 years, Pauline, of Rockville; two sons: William of Taneytown, MD and John of Castle Rock, CO; and two grandchildren.

Sources: NIST Archives, *The Washington Post* of January 22, 2005, *Who's Who in The Fossils*, and Ralph P. Hudson

Herbert Steffen Peiser*, 87, died peacefully in his sleep on February 10, 2005 at his home in Asbury Methodist Village, in Gaithersburg, MD.

Steffen was born on August 9, 1917 in Grunewald, near Berlin, Germany. His father was Swiss and sent his son to Zürich through early school then to England for 'high school'. While in high school, he took first-year German language, which—unknown to his teachers—he already spoke fluently. He was caught when his father came for a parent-teacher conference. Later, he attended St. John's College, Cambridge University, between 1936 and 1941. He studied mathematics, chemistry and physics and received his "Honours B.A." in 1939, continuing on with chemistry for his M.A. in 1943. In 1939 he was awarded a *Hutchinson Research Studentship* at Cambridge University and worked on crystal chemistry under Sir W. Lawrence Bragg. In 1965-66 he was a visiting professor at Harvard University, Cambridge, MA.

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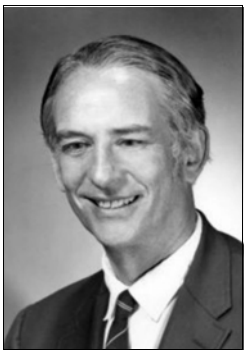
At the outbreak of World War II, though vehemently opposed to the Nazi regime, he refused to fire a weapon. Instead he helped the British army in several non-combative, but highly dangerous missions. He traveled the "underground railroad" between Italy and Switzerland helping women and children who were being persecuted for political/religious reasons to reach neutral Switzerland. He played an important role in the D-Day invasion of Europe by providing logistical support to the British army as well as surveillance activities to support heavy equipment and tank movements on the Normandy beaches. After the war he worked for a steel manufacturer in Sheffield, England.

In 1957, Steffen was invited to the U.S. to spend a year at NBS as a visiting scientist and he never left. He first worked as a bench scientist in the field of crystallography, and became chief of the Mass and Scale Section in 1959 in charge of precision-weighing in general and micro-weighing in particular. In 1962, he was appointed chief of the Crystal Chemistry Section. He was among the first to point out that the most interesting properties of crystals are not those associated with the physical, chemical, and structural properties of the 'ideally perfect' crystal, but are caused by characteristic crystal imperfections. His 1960 book *Diffraction by Polycrystalline Materials* was the only work that covered defect and microstructure analysis until the International Union of Crystallography-sponsored *Defect and Microstructure Analysis by Diffraction* was published in 1999.

It was his experience with X-ray diffraction that positioned him to join the free-radicals group at NBS, where he contributed to the analysis of upper-atmosphere chemical reactions and those of other planetary atmospheres and oceans. In collaboration with John B. Wachtman, he studied point defects and dislocations in crystals and, using group theory, was able to explain many of these phenomena. Another outgrowth of this work on crystals led to a collaboration with the late Richard Deslattes and a re-determination of Avogadro's number. By measuring the cell volume of a single silicon crystal and combining that with the results of X-ray measurements of the lattice spacing, the number of atoms can be derived. This work actually continued right up to his death.

He took over the responsibility for foreign interactions at the Bureau in 1969 as Chief of the Office of International Relations. His work for that office involved stewarding guest scientific workers from Europe, Asia, the Middle East, Australia and South America while they worked at NBS. Each year he hosted an eclectic Christmas/holiday party that bridged across many cultures and religions. In addition, on weekends he led the guest workers on expeditions to nearby areas of interest such as Sugarloaf Mountain for picnics, and the Pennsylvania Amish countryside to experience Americana. He was the principal liaison officer at NBS for the U.S. State Department, the U.N. and other internationally oriented organizations interested in the physical sciences.



Two of our former directors have commented on his enthusiasm and commitment to fostering international relations. John Lyons said: "Steffen Peiser was a man of many talents. I didn't know him when he was in the laboratory, but in his many roles since then he was, I think, unique. When he and Ed Brady were in the international office they were a combination unlike any other. I traveled with the two of them and that trip is one of my fondest memories. Steffen worked tirelessly for the Standards Alumni Association, which he presided over from 1988 to 1989. I worked with him on a write-up of the NBS work on proximity fuses in World War II and enjoyed every minute of it. He was a warm, friendly, and invariably courteous person; indeed he was the personification of the word 'gentleman'. He cannot be replaced." And according to Ray Kammer, "Steffen Peiser had an amazing enthusiasm and commitment for sharing the benefits of metrology with developing economies throughout the world. His effectiveness made him the best-known face of the National Bureau of Standards in countries that were establishing modern industrial economies."

Steffen was a prolific writer who authored more than 130 scientific papers and was honored by many scientific organizations. He retired officially from NBS in 1979 but continued his scientific work throughout retirement. Just prior to his death he was still working on a scientific paper with other authors, soon to be published, regarding Avogadro's number. He was (justifiably) very proud that even this late in his life a scientific paper was to be published bearing his name.

He was a Fellow of the Institute of Physics, the Chemical Society, the Mineralogical Society and the Sheffield Laboratory Society; past Honorary Secretary and Vice President of the Cambridge Chemical Society; and a member of the American Physical Society. Since 1960 he was a member of the Cosmos Club in Washington.

He was active in the committee that advised the Smithsonian Institution with the establishment of its "Science in Everyday Life" exhibit, advice that was not necessarily taken at all times.

Later in life his love of Switzerland translated to an active retirement both intellectually and physically. Steffen returned to Switzerland with each of his married daughters and their families and led them on hiking expeditions through the mountains in the Engadine region of Switzerland. Still later he took up bicycle riding. Then he again returned to Europe on several occasions, now accompanied by subsets of

his grandchildren aged 7 to 15, leading them on multi-city 100 mile long bike trips across Europe. In addition, he successfully tried out for the senior Olympics team twice, representing Maryland in several bicycle events, where he won Bronze and Silver medals, six in all, in the Maryland Senior Olympics for the 75-year-old group where he rode in both the 10- and 20-mile races as late as 1998.

A warm-hearted, friendly, very intelligent, stubborn, opinionated-but-open-minded individual, Steffen was always ready to lend his help to anyone who needed his help, but had trouble accepting help from others. He continued a very extensive correspondence, first by written letter and later by email, with his family, numerous friends and scientific colleagues. He enjoyed reading and was well informed on political, economic and scientific news. (Too well informed, perhaps, for someone trying—only occasionally—to disagree with him!) For many years his favorite rejoinder to being asked the question, "Steffen, how are you?" was "Oh, just terrible, thank you!"—always delivered with his broad smile.

At the Cosmos Club he enjoyed the lectures, and playing chess and bridge. He also enjoyed collecting both stamps and coins, as well as solving jigsaw and mathematical puzzles. After moving from Rockville to Asbury Methodist Village about 7 years ago, he served on several committees and organizations in that retirement community.

Sadly, his beloved wife of 56 years, Primrose Peiser, 91, died five days after his death, on February 15, 2005.

He is survived by three daughters: Clare Goodman of Rockville, MD, Georgie Dreibelbis of Atglen, PA and Alison Kretser of Salisbury, MD; a sister, Giesla Perutz of Cambridge, England; and six grandchildren.

Sources: NIST Archives, Keith Goodman, and *The Washington Post*, February 12, 2005

Walter John Pummer, 78, a former NBS organic chemist in the Polymers Division, died on November 29, 2004, four days before his birthday. He lived in Germantown, MD.

Born in Allentown, PA, he graduated from Mount St. Mary's College, MD, in 1950 with a B.S. in organic chemistry and received an M.S. degree in the same subject from Wayne State University in 1953.

Walter came to NBS in May of 1953 and stayed for over 30 years. He started in the Polymer Structure Section of the Organic and Fibrous Materials Division and remained in the Polymers Division through the various organizational changes until he retired in 1987. For a major portion of that time he was involved in the synthesis of organic monomers, in particular those derived from aromatic fluorocarbons. He studied the kinetics and mechanisms of the thermal decomposition of aromatic heat-transfer fluids, the working fluids to be used at high temperatures in electrical generators for space probes. He also studied the combustion and thermal properties of ultra-violet-irradiated polymers and the synthesis and hydrolytic stability of polyurethane elastomers.

He received the Department of Commerce Silver Medal in 1966 for "his outstanding researches into the chemistry of aromatic fluorocarbons and in particular for his basic investigations of the mechanisms of nucleophilic attack on aromatic fluorine. As a result he has synthesized many new fluoro-aromatic polymers and monomers having great potential for use as materials, stable under many extremely deteriorative conditions. The breadth and depth of Mr. Pummer's accomplishments attest to his many excellent attributes, acumen, indefatigable persistence and industry, as well as to his ability as a chemist."

He was a member of the American Chemical Society.

He was an avid golfer, playing after work when the light held late enough.

Husband of the late Esther May Pummer, he is survived by three daughters: Cozette Simpson, Lynn Wood, and Margaret Moreland; one son, Michael; ten grandchildren and two great-grandchildren. His other son, Gregory, predeceased him.

Sources: NIST Archives; *The Washington Post*, December 1, 2004; Daniel Brown and *American Men and Women of Science*, 1979.

Michael B. Schmitt, 56, a senior management adviser with NBS/NIST, died on February 1, 2005 at Suburban Hospital in Bethesda, MD. He had leukemia.

A District of Columbia native and resident of Germantown, MD, Mr. Schmitt grew up in University Park, MD. He was a 1967 graduate of Northwestern High School in Hyattsville, MD, where he was an accomplished trumpeter and acted in school drama productions. He received a bachelor's degree in political science from Allegheny College in Meadville, PA, in 1971 and worked at the Department of Agriculture from 1972 to 1979.

Mr. Schmitt came to NBS in 1979 as an administrative officer in the Office of the Director of the Center for Building Technology. He kept the same position in the Center for Manufacturing Engineering from 1985 until the reorganization of 1988, when he became Executive Officer in the Manufacturing Engineering Laboratory. As a member of the laboratory's management team, he was responsible for finance, budget, procurement and personnel functions. In 2003 he served as chairman of the NIST Management Advisory Council, an organization charged with ensuring the efficiency of administrative policies and procedures at the agency.

Mr. Schmitt was a member of Covenant United Methodist Church in Montgomery Village, MD. He served for

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many years as financial secretary of the church and was a member of its finance committee.

He was an avid baseball fan and a collector of cards and autographs of minor-league ballplayers. He especially loved meeting younger players and tracking their progress into the big leagues. He also was a student of the original Washington Senators and reveled in meeting some of his childhood heroes of the 1950s at card shows. He also belonged to the 'Super Pool', a group of college friends who stayed in touch through an annual contest to select winners of pro-football games, a contest that culminated in a party on Super Bowl weekend. The contest was highly competitive even though, by rule, no money ever changed hands. He was a past winner of the 'John K. Brallier Cup', awarded to the member with the most correct picks during the season.

Survivors include his wife of 32 years, Lynn V. Schmitt of Germantown; two daughters: Hannah Schmitt and Rebecca Schmitt, also of Germantown; his mother, Joyce B. Schmitt of Gaithersburg; and two brothers: Thomas E. of Concord, NC and Richard B. of Derwood, MD.

Sources: NIST Archives and *The Washington Post*, February 8, 2005.

Shuford Schuhmann*, 88, a former NBS chemist, died on December 11, 2004 of a stroke at Holy Cross Hospital in Silver Spring, MD. He lived in Bethesda.

"Schu", as he was known, was born in Corpus Christi, TX, and grew up in Long Beach, CA and Gunnison, CO. He attended Western State College in Gunnison and received a bachelor's degree in chemistry from The George Washington University in 1938.

Schu came to Washington in 1935 as a gas chemist in the Resistance Measurements Section of the Electricity Division. He moved to the Molecular Structure and Properties of Gases Section of the Chemistry Division in 1938 and became expert at analyzing samples with a mass spectrometer. Later, in 1960, he worked on vacuum standards in the Mechanical Instruments Section of the Mechanics Division. He retired from NBS in 1966.

He then took a position as an analyst with NASA's Goddard Space Flight Center in Greenbelt, MD. While there, he performed mass-spectrometry analysis of moon rocks and other lunar material returned from Apollo space missions.

In 1977 he left NASA to continue his research on lunar rocks at the University of Hawaii for two years. He was the co-author of many papers analyzing trace elements and other materials returned from space.

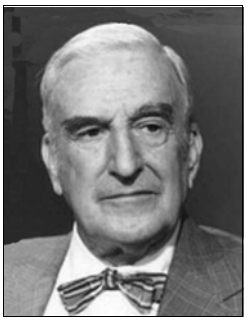
After returning from Hawaii, Schu worked at a hardware store in Bethesda for several years. He was very capable with his hands and could repair cars, plumbing and household appliances. He enjoyed canoeing, hiking and ice skating, and learned to ski in his sixties. He also was known for his puns and word-play.

He was a member of the American Chemical Society and the Potomac Appalachian Trail Club.

Survivors include his wife of 58 years, Priscilla Jencks Schuhmann of Potomac, also employed at NBS in the mid-1940s; three children: Dr. Deborah Schumann and Jeremy Schuhmann, both of Bethesda, and Dr. Reinhardt Schuhmann of Brookhaven, NY; and three grandchildren.

Sources: NIST Archives and *The Washington Post*, December 24, 2004.

Lauriston S. Taylor*, 102, a radiation physicist at NBS and a pioneer in the field of radiation safety, died of Alzheimer's disease on November 26, 2004 at the Collington Retirement Center in Mitchellville, MD. Except for a period of time overseas during World War II, he lived in Bethesda, MD from 1930 to 1990, when he moved to the retirement center.



Lauriston Taylor, known as Laurie, was born in Brooklyn, NY, and grew up in Maplewood, NJ. As a grade school student, he visited Thomas A. Edison at his laboratory in nearby South Orange, NJ. He attended the Stevens Institute of Technology in Hoboken, NJ, to study engineering but dropped out after a year to earn money for tuition. He received a bachelor's degree from Cornell University in 1926 but left shortly before finishing his doctorate in physics to join the National Bureau of Standards. He received two honorary D. Sc. degrees, one from the University of Pennsylvania (1960) and the other from St. Procopius College (1965).

Mr. Taylor joined NBS in 1927 as the first federal employee to work in the rapidly growing area of X-ray applications in medicine and other sciences. His work led to the establishment of the first national standard for X-ray exposure. For the next seven decades, he studied the health effects of long-term exposure to low levels of radiation and other issues of radiation science. Taylor's work led to the first U.S. standard for X-ray exposure.

As a 26-year-old researcher at NBS, Mr. Taylor found out first-hand about radiation exposure. He was calibrating clinical radiation meters in an X-ray beam and forgot to replace a lead panel, thereby receiving several minutes of full-body exposure to radiation. "He seemed to have suffered no ill effects," his son Nelson Taylor said, noting his father's longevity. He used the mishap to construct a portable battery-operated meter to measure exposure rates. He also used the experience years later as a government witness in a number of court cases involving workers exposed to small amounts of radiation. He argued that small doses were not dangerous.

At a time when doctors, nurses and medical technicians were badly burned by overdoses of high-level X-ray radiation, Mr. Taylor became the principal author of the first workplace radiation standards, established by NBS in 1934. "We didn't know anything really about body/organ response to radiation," he told the Boston Globe in a 1994 interview. "The evidence we had wasn't very much."

He also was founder, and for 48 years president, of the National Council on Radiation Protection and Measurements. "Lauriston Taylor combined a solid physics background with amazing talents as an administrator and politician," Thomas Tenforde, the council's current president, said in a statement released by the Bethesda-based organization. "He was able to attract leading scientists in physics, medicine, biology and public health to work as volunteers on the expert committees that produce [the council's] reports."

He also organized the U.S. Advisory Committee on X-Ray and Radium Protection in 1929. His work with these groups and with the Council on Radiation Protection was a necessary step in establishing definitive standards for X-ray shielding and for safe X-ray exposure limits for radiation workers and the public. The teams of scientists that created the first atomic bomb used the council's standards, which Mr. Taylor helped develop.

In 1940, the National Defense Research Committee commissioned Mr. Taylor to organize a new proximity fuze for antiaircraft ammunition. The British relied on the fuze to defend themselves against German air raids. In 1943, he set up an operations research program for the Army, first with the Army Air Corps 8th Fighter Command and then with the 9th. Based in England, he was scientific adviser to Lt. Gen. Hoyt S. Vandenberg. As the war ended, he became director of the U.S. Continental Air Command's operations research division.

He was awarded the Bronze Star and the Medal of Freedom (1946) for his work with the military.

In 1946 he returned to NBS as chief of the X-ray Section of the Optics Division. In 1948 he took a year's leave of absence to organize and direct the U.S. Atomic Energy Commission's biophysics branch. His projects included early work on the long-range evaluation of ^{90}Sr from nuclear fallout. He became chief of the Radiation Physics Laboratory in 1949, chief of the Atomic and Radiation Physics Division in 1951 and chief of the Radiation Physics Division in 1960. In 1962, he became associate director of NBS, retiring in December 1964.

During his years at NBS, he received the U.S. Department of Commerce Gold Medal (1949) for exceptional service and the NBS Rosa Award (1965) for "...development of national and international standards for radiation protection".

He then moved to the National Academy of Sciences as special assistant to the president and executive director of the academy's advisory committee on emergency planning. He retired from the Academy in 1972, while continuing as president of the National Council on Radiation Protection until his third retirement in 1977. He also continued consulting and writing until his late nineties. He wrote about 160 papers and all or part of 20 books, the last one at age 97.

In addition to the awards already mentioned, he received the U.S. President, Executive Office: Distinguished Service Award (1968); the Gold Medal of the Royal Swedish Academy of Sciences (1973); the *Antoine Beclere Prize* and Gold Medal of the International Society of Radiology (1981); and the Gold Medal of the American Roentgen Ray Society (1992). The *Lauriston S. Taylor Lecture Series* was established in 1977 by the National Council on Radiation Protection and Measurements in his honor.

His memberships included Sigma Xi (since 1926), the American Association for the Advancement of Science, the American Association of Physicists in Medicine, the American Roentgen Ray Society, the Health Physics Society (President 1958–1959), the Radiation Research Society and the Radiological Society of North America. Also, he was a Fellow of the American Physical Society, the American College of Radiology, the Washington Academy of Medicine and the Washington Academy of Sciences.

Mr. Taylor's first wife, Azulah Walker Taylor, died in 1972. A son, Lauriston S. Taylor Jr., died in 1992. Survivors include his wife of 31 years, Robeana Taylor of Mitchellville; a son, Nelson Taylor of Pensacola, FL; four stepdaughters: Christine O'Shiell of Hilton Head, SC, Carolyn Arthur of Woodlawn, CA, and Cynthia Nagle and Constance Taylor, both of Erie, PA; 18 grandchildren; 24 great-grandchildren; and two great-great-grandchildren.

Sources: NIST Archives and Joe Holley, Staff Writer, *The Washington Post*, December 14, 2004.

Donald Hsi-nien Tsai*, 81, a former member of the Heat Division of NBS, died peacefully at home with his family on January 9, 2005 in San Francisco, CA. Although unable to regain his strength after a second battle with cancer, his mind remained clear. A long-time resident of Potomac, MD, he had moved from Maryland to San Francisco in February 2004.

Don was born on July 4, 1923 in Shanghai, China. He came to the United States through the port of San Francisco, on the last boat from Shanghai in August 1941. He graduated with a B.A. in mathematics from Pomona College in 1944 and served as a civilian translator in the U.S. Marine Corps,

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1945-47. He earned his M.S. and Sc.D. in aeronautical engineering from the Massachusetts Institute of Technology in 1948 and 1952 respectively.

He was hired as a mechanical engineer by NBS in 1952 to work in the Engines and Lubrication Section of the Heat and Power Division to test engine-generators for the U.S. Army. Thanks to a delay in the start of this program, he had time to write up his dissertation for publication and gave a talk about his work at a colloquium in his division. It described his use of a high-speed computer at MIT in the study of the dynamics of airflow in the inlet system of an internal combustion engine. The use of a computer for engineering research was of interest to the large group in the division involved in calculating the thermodynamic properties of air. His chief, Dr. Ferdinand G. Brickwedde, approved a proposal to extend his work to study similitude in the flow dynamics as the size of an engine changed, which was an important step in the evolution of the inlet-system design in internal-combustion engines to the one used by many manufacturers today. He received an outstanding-paper award from the Oil and Gas Power Division of the American Society of Mechanical Engineers in 1956 for the paper published on this work. Don greatly appreciated Brickwedde's management style. It provided an environment in the Heat and Power Division where there was opportunity for exploration and personal development and Don credited him with making his transition from engineering to computational solid-state physics possible.

When Dr. Brickwedde left NBS in 1956, the Engines Section was abolished and the division was renamed the Heat Division and headed by Dr. Charles M. Herzfeld. Don was now an Aeronautical Research Engineer in the Thermodynamics Section. Don's earlier experience with computer modeling stood him in good stead when he decided to study the response of crystalline solids to shock compression. In 1962–63, he spent a year at the Technische Hochschule in Stuttgart, Germany. He made further progress during a year's leave at the Atomic Energy Research Establishment, Harwell, U.K. in 1968 and, for the rest of his career in the Equation of State and later in the Statistical Physics Section, he continued to work on the molecular dynamics of crystalline solids under non-equilibrium conditions, studying thermal conductivity and diffusion, heat-pulse propagation, and shock-wave propagation. One important result of studying the thermal-relaxation process was the finding that the phenomenon of second sound was a general property of solid-state excitation. He also ventured, in the late 1970s, into the description of the response of liquids to these violent impositions. He began in 1980 a long and fruitful collaboration with scientists of the Army Research Development and Engineering Command wherein the mechanisms by which energetic materials initiate reactions and transfer energy were studied. All of his work was seminal. It revealed properties of the materials that had not yet been measured.

In order to do this work, state-of-the-art computing facilities were needed, and Don, a heavy user of machine computation, fought tirelessly to get such facilities on site. Although NBS was at the forefront of computer development in 1950, the agency was very slow to provide its staff with ready access to high-speed computers for several decades. In the 1970s and early 1980s, use of the central computer cost so much that Don, as a guest of scientists in other agencies—in particular the U. S. Atomic Energy Commission in Germantown, MD—shared time on their computers. The situation improved when NBS Director Dr. E. Ambler removed the charges for staff use of the main computer (UNIVAC) in 1983, but it was not until 1985 that NBS finally had its own supercomputer, the CYBER205. Always innovative, Don and his colleagues used every "work station" available at NBS to continue the calculations.

Don retired that year. In his retirement, he continued research and writing on the dynamical response of crystals to shock waves using multiple personal computers.

He was a member of the American Physical Society. He was also a member of the Philosophical Society of Washington and served as its President in 1981.

Don greatly valued the friendships he developed over the years at the Bureau. He enjoyed tennis and, over a 20-year period, participated regularly in the NBS recreational tennis league, winning his full share of both singles and doubles matches. He was skilled at home remodeling—he rebuilt both decks at his house and he dug and installed a heated driveway to melt ice on the steep slope up to the road in winter.

His wife, Sylvia Sia Tsai, died in 2003—three weeks short of their 55th wedding anniversary.

He is survived by his daughter Patricia and son Brian in San Francisco; a sister Cai Qingnian and brother Cai Yingnian in Shanghai.

He was the most wise and gentle of men we have known. He is, of course, sorely missed.

Sources: NIST Archives; *The Washington Post*, January 29, 2005; and Sam Trevino, Hank Prask, Rosemary MacDonald and Patti Tsai

Tung Tsang, 72, a former NBS chemical and solid-state physicist, died of heart disease and pneumonia on January 1, 2005 at his vacation home in Hayward, CA. He was a Rockville, MD resident.

A precocious student in his native Shanghai, he graduated from high school in 1945 at the age of 13 and from Datong University in Shanghai around the time of the Communist take-over in 1949. He moved to the United States that year and received a master's degree in chemical

engineering from the University of Minnesota and a doctorate in chemistry from the University of Chicago. Early in his career, he worked for about two years for Honeywell in Minnesota and nine years for the Argonne National Laboratory in Chicago.

Dr. Tsang came to the Washington area in 1967 to join the Solid State Physics Section of the Inorganic Materials Division. He left NBS at the end of 1970 to join the physics faculty of Howard University.

During his career at Howard University, Dr. Tsang wrote more than 100 scientific papers and two textbooks: *Statistical Mechanics* (2002) and *Classical Electrodynamics* (1997).

His interests included chess and bridge.

Survivors include his wife of 47 years, Dolly Tsang of Rockville; a daughter, Susan Persons of San Francisco; a sister; and two grandchildren. A daughter, Patricia Tsang, died in 1973.

Sources: NIST Archives and *The Washington Post*, January 23, 2005.

We have recently learned of the following deaths: on February 9, 2005 of Robert Kearns, an NBS engineer and inventor and, on February 26, of Howard St. Clair Jones, Jr., a former electronic physicist at NBS and Harry Diamond Labs. Their obituaries will be prepared for the next Newsletter.

* Indicates SAA member

—Rosemary MacDonald

8. NEWS OF ALUMNI

No news of alumni was reported this past quarter.

9. BIRTHDAYS OF SAA MEMBERS 75 OR OLDER

April 2005

Brewer, Frank H. 11/1925
Cassatt, Audrey 3/1927
Creitz, Elmer C. 20/1907
Enagonio, Barbara F. 13/1923
Haverfield, John W. 22/1925
Hubbell, John H. 9/1925
Hudson, Nancy 9/1923
Jacox, Marilyn E. 26/1929
Johannesen, Phyllis W. 9/1924
Leiss, Wilma D. 17/1924
Mauer, Floyd A. 30/1924
McKinney, John E. 6/1925
Ordway, Fred 9/1922
Phillips, Clinton W. 24/1919
Prince, Katharine 1/1930
Rosenblatt, Joan R. 15/1926
Scribner, Bourdon F. 13/1910
Wachtman, Lucy T. 25/1922
Watson, Thomas W. 20/1914
Williams, Earl S. 13/1920

May 2005

Bates, Roger G. 20/1912
Berger, Patricia W. 1/1926
Brungraber, Ruth Ann 13/1929
Bullman, George W. 22/1923
Dunfee, Bernadine L. 13/1914
Eby, Ronald K. 7/1929
Engel, Joseph H. 15/1922
Fletcher, Donald G. 19/1922
Furukawa, George T. 25/1921
Heinrich, Kurt F. J. 31/1921
Hoffman, Alan J. 30/1924
Howard, Charles P. 18/1923
Jones, Frank E. 6/1925
Kirby, R. Keith 31/1927
Kostkowski, Henry J. 11/1926
Landon, Harry H. 11/1923
Kropschot, Richard H. 25/1927
Lide, David R. 25/1928
Margoshes, Marvin 23/1925
Oroshnik, Jesse 12/1924
Powell, Anne R. 5/1925
Smith, Ernest K. 31/1922
Tayman, William P. 2/1923
Tillett, Linda 30/1929
Tilley, W. Reeves 13/1920
Todd, John 16/1911
Walker, Raymond F. 20/1925
Whalen, Jr., Ralph L. 19/1926
Wykes, Mary M. 13/1925

June 2005

Beers, John S. 27/1923
Berger, George H. C. 21/1923
Burroughs, Grace E. 6/1930
Cannon, Irene 15/1916
Cook, Richard K. 30/1910
Costrell, Louis 26/1915
Ghaffari, Abolghassem 15/1907
Herzfeld, Charles M. 29/1925
Kirsch, Russell A. 20/1929
Kramer, Samuel 2/1928
Leiss, James E. 2/1924
Levine, Robert S. 4/1921
Lewett, George P. 5/1926
Richards, Esther S. 30/1914
Scace, Patricia A. 5/1930
Strang, Arthur G. 15/1920
Taylor, Helen A. 20/1914
Toense, Doris J. 13/1926
Walker, Molly 3/1925
Washburn, Andrea H. 28/1921
Young, John P. 18/1918
Zelen, Marvin 21/1927

10. ASSOCIATION NEWS

Portrait Gallery

Dick Wright reported for the Portrait Gallery Committee that the jury will meet on March 14 to pick the ten individuals comprising the 'Class of 2005' from the twenty-five nominations received before the February 15 submission deadline. The results of their deliberations will be announced in the next issue of the SAA Newsletter.

The NIST Portrait Gallery of Distinguished Scientists, Engineers and Administrators recognizes former NBS/NIST staff members for outstanding career contributions to the work of NBS/NIST. Portraits and biographies of those selected are displayed in the corridor of the NIST cafeteria at Gaithersburg. Any current or former NIST staff member may make a nomination for future addition to the Gallery. Nominations of distinguished women and minorities are encouraged. While nominations are closed for this year, it is none too early to consider nominating a worthy individual for the next round. Nomination instructions are available from the Standards Alumni Association, Room A-42 Admin, Mail Stop 0952, NIST, Gaithersburg, MD 20899-0952; telephone 301-975-2486; by email: alumni@nist.gov; or from our website: <www.nist.gov/director/saa>.

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SAA Officers Meet with NIST Director

SAA president Jerry Kruger and Senior Operations Officer Hans Oser met with NIST Acting Director Hratch Semerjian on Wednesday, March 2, to report on SAA projects and offer support for future NIST historical activities. Among SAA activities discussed were the support for the NIST Oral History project, the present effort to encourage former staff to write reminiscences and the newest project, an annual historical lecture to be presented to the staff at the end of each year. Semerjian expressed the Institute's appreciation for the SAA and its contributions to preserving NBS and NIST history.

SAA Supports NIST Oral History Project

The NIST Information Services Division (library) has an active Oral History Project wherein retirees having had key technical, managerial or administrative responsibilities during their careers are interviewed by a panel of their contemporaries. They are encouraged to convey the highlights of their careers and interactions with others to capture both historical facts and the atmosphere within the agency for the use of future historians.

David Lide and Ralph Hudson have been orchestrating SAA support for this effort by heading up a small group that recommends interviewers and panel members, and helps edit transcripts of the interviews. Over the past two years George Porter, Bourdon Scribner, Jack Hoffman and Sam Kramer have been interviewed. There are plans to interview two others—Peter Heydemann and Thomas Gary—this fiscal year.

SAA Encourages Written Reminiscences

Reacting to the gross disparity between the list of 110+ possible oral history interviewees and the resources available to carry out the interviews, Ralph Hudson proposed a project to encourage those on the list to write reminiscences of their time at NBS/NIST. His proposal was enthusiastically received and invitations are being sent to those listed. The reminiscences will be added to the historical archives kept by the Information Services Division.

SAA Newsletter Available On-Line

At its February 2005 meeting the Board of Directors voted to make the *SAA Newsletter* available on-line via the SAA web site <http://www.nist.gov/director/saa/>. After some discussion it was decided to delay the Internet posting by three months, i.e., by one issue, and that up to four issues would be made available.

—Norm Belecki

11. HISTORICAL ACTIVITIES

Volunteers Wanted for Library Project

The NIST Information Services Division (ISD), familiarly known as The Library, is seeking assistance from NIST alumni for its "Finding Aids" Project. The ISD goal is to identify, categorize, and catalogue papers in the large collections that have been derived from the files of distinguished former members of the NBS/NIST staff. The resultant "finding aids" will permit researchers to recognize and locate papers of particular interest.

The following collections have so far been identified as needing work:

- Papers of Charlotte Moore Sitterly. Harriet Hassler has made considerable progress in cataloguing various categories of correspondence, news items, etc., placing them in (archival) folders in library boxes.
- Papers of Harold Stimson. Work is in progress, but help is desired in preparing a biographical sketch or locating one in the public domain. [Note: It is intended that such biographical sketches be made part of all collections.]
- Papers of Jacob Rabinow. A large number of large boxes have already been identified by category (e.g., Inventors Council, Energy-Related Inventions, various research activities, etc.). ISD would like this file to be a top priority for SAA assistance.
- Walter S. Weinstein file.
- Robert Stiehler file.

At its meeting on February 2, the SAA Board voted to support this activity and to find alumni willing to participate in this activity. The Library is making a room available for working and may be able to provide a computer. Training by an archival-training instructor will be provided.

If you are interested in volunteering (or would like more information), please contact the SAA/ISD Committee Chair by e-mail at walter.leight@nist.gov, or by phone (leave a message at 301-975-4010). [If more convenient, contact harriet.hassler@nist.gov, 301-975-5325.]

—Walter Leight

12. COMMUNICATIONS

From your editor:

Mea Culpa

Our apologies go out to NIST researcher Kalman Migler, whose name was misspelled in a news item on nanotubes in the September 2004 issue ("Serendipity Strikes

Again", *SAA Newsletter*, vol. 20, no. 3, p. 7, Sept. 2004). I also note, in the last issue, the misspelling of the *Frederic Ives Medal* ("NIST Honors and Awards", *SAA Newsletter*, vol. 20, no. 4, p. 12). Thanks to Hans Oser, who discovered the errors while indexing the issues involved.

I might note that I have asked the reporters of the *NIST News* section to include whenever possible the names of the staff doing the work being reported. Staff members are often not identified in the *NIST Tech Beat* items from which the reports are drawn.

Plea for Volunteers

As you know, the information in each edition of the *SAA Newsletter* is collected by our volunteers, people whose names are listed on page 2 below the table of contents. In most cases a volunteer is responsible for a given section and has no one to turn to as a backup. If you would like to help report the activities of the SAA and NIST, and like to write, please volunteer a few hours of your time four times a year. Much of the work can be done at home, especially if you have Internet access, and no travel to NIST is necessary. Give one of our long-time contributors a little help and rediscover the world of NIST! Contact me and let me know of your interest.

—Norm Belecki

Changes to Directory begin on next page

13. RESERVATION FOR SAA DINNER MEETING OF APRIL 6, 2005

Please complete the reservation form below and return it, together with your payment, to reach us no later than Monday March 28, 2005. If an emergency forces you to cancel your reservation, please call us at 301-975-2486 by noon of April 4, 2005, if you want your money refunded; if no one answers, just leave a message on the voice-mail system or send an email to <alumni@nist.gov>.

I/We will attend (you must furnish full names below).

Payment enclosed for _____ persons @ $20.00 each.

Name(s) _____

_____

_____

Make check payable to SAA and return by March 28, 2005, to:

SAA
Room A42 Administration Building
NIST
Gaithersburg MD 20899-0952

N.B. Please read about the security arrangements in force at this time, and the requirements for visitors to gain admission to NIST, spelled out on page 4.

14. CHANGES TO THE DIRECTORY

New members:

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Reverse of Dinner Reservation Form

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Nominations	Anneke Levelt Sengers Richard Wright		
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